

NORTH HOUSTON HIGHWAY IMPROVEMENT PROJECT

NEED AND PURPOSE

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Section 1

Need for and Purpose of Proposed Action

Per Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), an Environmental Impact Statement (EIS) prepared for a proposed action should describe the problem(s) or other needs that the proposed action is intended to address (40 Code of Federal Regulations [CFR] 1502.13). Transportation improvements are needed within the North Houston Highway Improvement Project area in Houston, Texas, because the existing Interstate Highway (IH) 45 facility currently operates near capacity resulting in congestion during peak and off-peak periods. Additionally, future transportation demand from projected population and economic growth is expected to place a greater strain on the existing facility. The population of the entire Houston-Galveston region is expected to increase by an estimated 3 million people, or 65 percent, between the years 2000 to 2035, while the growth rate in the study corridor is projected to be approximately 35 percent. The additional demand will put a strain on the existing facility. The purpose of the proposed action is to help manage the projected transportation problems in the North Houston Highway Improvement Project corridor to improve mobility and safety.

The limits of the proposed project begin at the interchange of United States Highway (US) 59 and State Highway (SH) 288 and follow northward along IH 45 to the interchange of IH 45 and Beltway 8 North, a distance of approximately 16 miles. The proposed project area also includes portions of IH 10 and US 59 near the downtown Houston area, Hardy Toll Road located north of downtown Houston to Beltway 8 North, and IH 610 and Beltway 8 between IH 45 and Hardy Toll Road. *Section 1.1* describes the project area in more detail. The project area is shown on *Figure 1*.

1.1 Need for Proposed Action

In 1982, a one-way, reversible high occupancy vehicle (HOV) lane was retrofitted into the center of IH 45 North (North Freeway) from IH 10 to Farm-to-Market Road (FM) 1960, a distance of approximately 20 miles. This retrofit eliminated the interior shoulders of the freeway. Subsequent reconstruction of the facility occurred but did not take substantial additional right-of-way (ROW). Therefore, because of the HOV lane, the segment between IH 610 and Shepherd Drive does not meet current design standards. IH 45 North has been in its current configuration since 1990.

In 2002-2003, an Alternatives Analysis (AA) was conducted for the North-Hardy Corridor Study, examining both highway and transit alternatives from downtown Houston to SH 242 near The Woodlands.

Transportation needs and alternatives to address those needs in the North-Hardy Corridor were documented in three reports listed below, beginning with the Alternatives Analysis (AA). The studies evaluated transit and highway improvement alternatives for a corridor from downtown Houston to 30 miles north, principally in the area between IH 45 and the Hardy Toll Road, and including Bush Intercontinental Airport (IAH) and segments of IH 45 and US 59 south of downtown.

2003 North-Hardy Corridor Alternatives Analysis Report

Examined transit and highway alternatives; recommended that transit alternatives be examined prior to detailed evaluation of highway alternatives. The AA determined that even with parallel high-capacity transit and the extension of the Hardy Toll Road to downtown Houston, additional capacity would be needed on IH 45. The AA also concluded that, at minimum, two-way HOV service would be needed in the corridor. The preferred alternative from the 2003 study proposed 12 lanes from IH 10 to Beltway 8 North (8 general purpose lanes and 4 managed lanes) and 12 lanes from Beltway 8 North to FM 1960 (10 general purpose lanes and 2 HOV/high occupancy toll [HOT] lanes). Managed lanes are lanes designated for specific uses such as toll traffic, transit, or trucks. HOT lanes refer to high occupancy/toll lanes that are specifically designated for high occupancy vehicles and toll traffic.

2004 North-Hardy Corridor Planning Studies, Alternatives Analysis Report (Transit Component)

Findings were used to develop a regional Transit System Plan that combines an aggressive bus service program with Advanced High Capacity Transit (light rail). The Metropolitan Transit Authority of Harris County (METRO) is currently constructing 5.5 miles of the North Corridor Light Rail Transit project.

2005 North-Hardy Planning Studies, Alternatives Analysis Report (Highway Component)

The Recommended Highway Alternative from downtown Houston to Beltway 8 North is to add four managed lanes to the IH 45/Hardy Toll Road corridor.

The project area for this EIS is based on the study area of the previous Alternatives Analysis Report for the North-Hardy Corridor. The northern limit of the proposed project to be evaluated in this EIS is Beltway 8 North, which is a logical terminus for this project. *Figure 1* shows the project area, which encompasses the roadways that would be considered for improvements in order to address highway transportation needs in the North Houston Highway Improvement Project area from downtown Houston to Beltway 8 North.

The North-Hardy Planning Studies were completed in November 2005 and relied partly on information from the Houston-Galveston Area Council's (H-GAC) 2025 Regional Transportation Plan (RTP), which was the approved RTP at that time. Although this Need and Purpose statement utilizes some data from the previously completed studies, the need for the project will

be reevaluated, based on updated information, during the EIS process. The current approved regional transportation plan is the 2035 RTP Update. The proposed project is included in the 2035 RTP Update as an unfunded project.

Among the needs that were identified in determining the proposed transportation improvements to the portion of IH 45 extending from near downtown Houston northward to Beltway 8 North are the following:

- The roadway facility does not provide adequate capacity for existing and future traffic demands, resulting in congestion, longer travel times, and reduced mobility.
- The average daily traffic volumes on IH 45 in the areas from US 59 to IH 10 and IH 610 to Beltway 8 North are projected to increase by approximately 28 to 37 percent between 2011 to 2035. The average daily traffic volume on IH 45 between IH 10 and IH 610 is projected to increase by approximately 16 percent during the same period. Congestion can be measured by comparing the capacity of a roadway to the volume it carries during the peak hour. The higher the volume to capacity (V/C) ratio, the more congested the roadway. The facility currently operates at a V/C ratio of 0.84 to 1.18, with the higher V/C ratio between IH 610 and Beltway 8 North, which is “tolerable” to “moderate” congestion. Without improvements, the V/C ratio would increase approximately 36 percent in 2035, to a maximum of 1.6 in the area from Shepherd Drive to Beltway 8 North, which is classified as “severe” congestion, and to a maximum of 1.48 in the area between IH 610 and Shepherd Drive, which is approaching “severe” congestion.
- IH 45 (Pierce Elevated) serving the downtown area has an existing V/C ratio of 0.9, which is “serious” congestion, and is projected to increase to 1.2 by 2035.
- The one-way reversible HOV lane serves traffic in only one direction during the peak periods and is unused for large portions of the day, limiting its use. During the peak hour, the HOV lane congestion is “tolerable,” with a V/C ratio of 0.5.
- IH 45 is a designated evacuation route for the region; at its present capacity, its effectiveness would be limited in the event of a hurricane or other regional emergency.
- Portions of the IH 45 roadway do not meet current roadway design standards, creating a safety concern.
- Roadway design deficiencies also include inadequate stormwater drainage. Intense rainfall causes high water at the IH 45/IH 10 underpass and on the outside lanes and frontage roads between Parker Road and Gulf Bank Road. As an evacuation route, IH 45 cannot afford high water closures, especially during hurricane evacuations when high rainfall events are likely.

- Forecasts for commuter service indicate that even with parallel high-capacity transit in the corridor, managed lanes would be needed to support commuter traffic and express bus service.

1.1.1 Congestion

IH 45 is a major transportation facility serving the Houston metropolitan area. The City of Houston is the fourth largest metropolitan area in the United States and the largest in Texas. The Houston-Galveston area population is forecasted to grow by over 3 million people by 2035. IH 45 is currently congested in the peak period, and the projected population and employment growth in the northern sector of the city would cause increased travel demand within the corridor. Without the proposed improvements, the peak periods would increase in duration, resulting in increased traffic delays and diversions onto surrounding local streets.

Congestion is defined as the level at which transportation system performance is no longer acceptable due to traffic interferences (23 CFR 500.109). The level of system performance deemed acceptable by state and local officials varies by type of transportation facility, geographic location (metropolitan area or subarea, rural area), and/or time of day. In addition, according to H-GAC, the most congested areas are also areas where more crashes occur.

The existing IH 45 facility is used to transport the traveling public to and from home, work, retail, entertainment, and other activity centers. Travel destinations include downtown Houston, the Texas Medical Center, University of Houston, and Texas Southern University on the south end of the corridor, and The Woodlands and the Greenspoint area to the north. IH 45 is also a link to the three major airports in the region: George Bush Intercontinental Airport, Hobby Airport, and Ellington Field. The existing IH 45 facility is also used for through trips for travel origins and destinations that are outside the project area.

In addition to overall travel demand, congestion is aggravated by “bottlenecks” on the roadway. Bottlenecks are locations where merges and weaving due to busy entrance and exit ramps or the loss of a lane can cause traffic to slow, creating delays on an already busy facility. Critical bottlenecks on the IH 45 North Freeway (from north to south) are at Beltway 8 North, the Shepherd Drive curve where there is an entrance/exit to the HOV lane, ramp connections north and south of IH 610, IH 10 to Allen Parkway where merges and limited sight distance slow traffic, and at the interchange with US 59 and SH 288.

The need for additional capacity within the IH 45 corridor can be evaluated by the V/C ratio. V/C ratios that are less than 0.85 are considered to represent “tolerable” traffic conditions. V/C ratios between 0.85 and 1.00 indicate “moderate” levels of traffic congestion. V/C ratios over 1.00 indicate “serious” traffic congestion, and a V/C ratio over 1.5 indicates a “severe” level of traffic congestion.

Based upon the V/C ratios, existing conditions within the IH 45 corridor are tolerably to seriously congested, and with expected increases in population and employment growth, conditions will deteriorate further if no additional capacity is created. Year 2011 daily traffic volumes were approximately 163,000 vehicles per day (vpd) from US 59 to Allen Parkway; 201,500 vpd from Allen Parkway to IH 10; 192,000 vpd from IH 10 to IH 610; 254,500 vpd from IH 610 to Shepherd Drive; and 261,000 vpd from Shepherd Drive to Beltway 8 North. Daily traffic volumes include mainlanes and frontage roads only, no HOV lane volumes are included. The V/C ratios on these segments of IH 45 range from 0.84 to 1.18. The facility is essentially at capacity with average travel speeds around 25-30 miles per hour (mph) (Houston TranStar 2011). The degree of traffic congestion is reflected in the peak period speeds versus the posted speed limit of 60 mph. Use of the reversible HOV lane is controlled, thereby allowing it to operate at higher speeds. Weaving and merging at the HOV entrance/exit at Shepherd Drive contributes to further congestion.

Based on analyses in the 2025 RTP, the H-GAC identifies mobility and access among the goals for the Houston-Galveston region, strategies to meet these goals, and priority actions to be implemented by year 2025. The vision of the RTP is to enhance mobility by providing an efficient, affordable, safe, and environmentally responsible transportation system for both people and goods. The 2025 RTP indicates that future revenue for transportation improvements will not keep pace with future demands. According to the 2025 RTP, regional congestion levels in the Houston region will grow by 10 percent over present day levels even with the implementation of the 2025 RTP and congestion management practices in place to optimize operations, such as transportation demand management (TDM), transportation system management (TSM), and intelligent transportation system (ITS) improvements. TDM refers to managing the demand of the transportation network through modified travel patterns such as the 9-80 work week or telecommuting. TSM refers to managing the roadway facilities to maximize mobility by reducing bottlenecks and providing adequate weaving distances and intersection improvements. ITS includes detecting crashes and breakdowns to inform drivers, using changeable message signs, and coordinating signal timing to help with traffic flow.

The 2025 RTP forecasted population in the corridor from downtown Houston to Beltway 8 North (*Figure 2*) to increase from 92,320 in 2000 to 141,058 in 2025. This is a population increase of almost 53 percent in the analysis area. Employment in the area is expected to increase from 35,449 in 2000 to 58,352 in 2025, which is an increase of almost 65 percent. Predicted population and employment growth in the analysis area is presented in *Table 1-1*. In addition, areas north of Beltway 8 North included as part of the North-Hardy Planning Studies Alternatives Analysis Report (Highway Component) are expected to experience significant growth in population and employment (93 percent and 75 percent, respectively, between 2000 and 2025). The Montgomery County to SH 105 area shows a 119.7 percent population increase, as compared to a 53.6 percent increase in employment. H-GAC's 2035 RTP reports that larger residential developments are occurring farther from the region's business districts,

which currently contain a majority of the region's employment. This is evident in Montgomery County, as H-GAC studies project that household densities (households per square mile) in most areas of Montgomery County will more than double between 2005 and 2035.

Table 1-1. Population and Employment Growth

| Area | Population | | | Employment | | |
|----------------------------|----------------|----------------|------------------|----------------|----------------|------------------|
| | (2000) | (2025) | Percent Increase | (2000) | (2025) | Percent Increase |
| Downtown – IH 610 | 22,878 | 32,512 | 42.1 | 6,807 | 10,307 | 51.4 |
| IH 610 – Beltway 8 | 69,442 | 108,546 | 56.3 | 28,642 | 48,045 | 67.7 |
| Subtotal | 92,320 | 141,058 | 52.8 | 35,449 | 58,352 | 64.6 |
| Beltway 8 – Montgomery Co. | 55,646 | 93,146 | 67.4 | 38,523 | 79,481 | 106.3 |
| Montgomery Co. – SH 105 | 39,772 | 87,283 | 119.7 | 29,646 | 45,524 | 53.6 |
| Total | 187,738 | 321,487 | 71.24 | 103,618 | 183,357 | 76.95 |

Source: 2025 Regional Transportation Plan, H-GAC, 2005.

The demographic projections in the 2025 RTP indicate that daily vehicle miles traveled (VMT) on IH 45 between downtown Houston and Conroe will increase from approximately 10 million to over 17 million by 2025, a 76 percent increase.

Latent demand in the corridor could also add traffic to IH 45. Latent demand refers to traffic that does not use a facility once it reaches a certain point of congestion, but would use it if the capacity were increased or congestion lessened. In other words, there is a ready market of travelers that would use a facility once additional capacity is available. Latent demand is based on several factors such as the capacity and condition of alternate routes and the availability of transit.

If no improvements were made to IH 45, the V/C ratio for the general purpose lanes in the year 2035 would increase to 1.6 between Shepherd Drive and Beltway 8 North, which is "severe" congestion, and to a maximum of 1.48 in the area between IH 610 and Shepherd Drive, which is approaching "severe" congestion. Travel speeds during the peak period would drop to an average of less than 20 mph. With the improvements proposed in the 2002-2003 North-Hardy Alternatives Analysis, the V/C ratio on IH 45 is projected to range from 1 to 1.2 in 2025, which is moderate to serious congestion. The reversible HOV lane is projected to operate at a V/C ratio of 1.02 in 2025.

Projected demand in the corridor shows the need for expanded capacity. Managed lanes are a flexible and economical way to provide additional capacity. Four managed lanes are proposed to accommodate the forecasted transit use, which is projected to fill up a single lane in the peak direction, and still provide capacity for single occupancy vehicle (SOV) traffic and carpools. The

traffic flow in the managed lanes would be regulated by maintaining a minimum speed through variable pricing. Toll rates would vary according to the number of persons in a vehicle and the time of day. Carpools of three or more occupants and transit vehicles could use the lanes for free in the peak direction during the peak hours, and SOVs would pay a toll. The North-Hardy AA proposed four managed lanes to accommodate forecasted demand, which is projected to increase from 7,300 vpd in 2000 to approximately 17,500 vpd by 2025. The managed lanes would accommodate the increased transit and carpool/vanpool use and still provide capacity for single occupant toll traffic. The managed lanes would also provide two-way, all day service, unlike the current one-way reversible HOV lane.

1.1.2 **Safety**

The 2035 RTP Update reports that the likelihood of being in a fatal or injury crash in the Houston-Galveston region is 36 percent higher than the State of Texas average and 149 percent higher than the national average.

The HOV lane statistics are determined separate from the typical highway statistics so there are not comparable statistics; however, according to the Metropolitan Transit Authority of Harris County (METRO) Police Department, the HOV lane has averaged about two crashes per month between 2005 and 2008. The June 2011 Quarterly Report prepared by the Texas Transportation Institute for TxDOT and METRO reported that crash frequency on the IH 45 North HOV facility continued to be higher than most of the other facilities excluding the Katy (IH 10) facility. The report indicated that the cause of the crashes could be due to the fact that this facility is one of the oldest in the system with less than desirable design standards.

The 2035 RTP Update reports that according to National Safety Council methodology, traffic crashes cost the region approximately \$5 billion a year in motor vehicle damage, medical care, lost wages and productivity, insurance costs, and costs incurred by emergency management. In addition, it is estimated that half of the congestion experienced in the region is the result of incidents on the highway.

Crash data obtained from TxDOT on IH 45 from US 59 to Greens Road indicate that there were a total of 4,288 crashes (including 41 fatal crashes) reported over a three-year period from January 2008 through July 2011. *Table 1-2* summarizes these crashes by type. This section of IH 45 includes the project area from US 59 to BW 8.

Table 1-2. Crashes on IH 45 North

| Year | Fatal Crashes | Incapacitating Crashes | Non-Incapacitating Crashes | Possible Injury Crashes | Non-Injury Crashes | Unknown | Total Crashes |
|--------------|----------------------|-------------------------------|-----------------------------------|--------------------------------|---------------------------|----------------|----------------------|
| 2008 | 17 | 22 | 104 | 360 | 682 | 47 | 1,232 |
| 2009 | 10 | 14 | 71 | 269 | 524 | 31 | 919 |
| 2010 | 9 | 45 | 118 | 373 | 889 | 41 | 1,475 |
| 2011* | 5 | 18 | 54 | 159 | 412 | 14 | 662 |
| Total | 41 | 99 | 347 | 1,161 | 2,507 | 133 | 4,288 |

* Data available through July 2011

Source: Texas Department of Transportation 2011.

1.1.3 Emergency Evacuation

Another safety issue for the Houston region is emergency evacuation. IH 45 is identified as an emergency evacuation route for the Houston-Galveston region in the event of a major storm, hurricane, or chemical spill. During Hurricane Rita in 2005, approximately 2.5 million people attempted to evacuate the region, resulting in stopped traffic for miles on major arterial freeways, where it took up to nine hours to travel a distance of 10 to 20 miles. Additionally, the depressed section of IH 45 in the vicinity of Main Street flooded during the heavy rainfall associated with Tropical Storm Allison in June 2001, reducing the capacity of the roadway for evacuation. In addition to Tropical Storm Allison, TxDOT has observed drainage and flooding problems on the freeway main lanes at this location during times of intense rainfall. Flooding/drainage problems also occur on the IH 45 frontage roads at three primary locations: between Tidwell and Parker, at North Shepherd, and at SH 249/West Mount Houston Road. A current TxDOT drainage criterion calls for storm sewers draining interstate highways to be designed for the 10-year design storm event. Currently in Harris County the 10-year design storm frequency is 2.9 inches/hour in the project area. Some existing roadways, including IH 45 in the project area, are not designed per the current drainage design criteria and, when flooded, have reduced capacity for evacuating vehicles.

Adding capacity to IH 45, especially lanes that are flexible in operation, such as managed lanes, would increase the carrying capacity of the roadway, providing more efficient evacuation capabilities. Bringing the facility up to current design standards would also improve the operation and safety of the facility during normal and emergency operations.

1.1.4 Roadway Design

The IH 45 roadway facility does not meet current roadway design standards. There are narrow lane widths, narrow or non-existent shoulders, low bridge clearances, and several structures

that are functionally obsolete that can have a negative impact on transportation safety and operations in the corridor. Roadway improvements that would correct design deficiencies may require acquisition of additional ROW in some areas. Incorporating additional lanes in the IH 45 or Hardy Toll Road corridor would require additional ROW in some areas. Between the IH 45/IH 10 interchange northward to IH 610 North, potential ROW acquisition would likely be required at intersections of IH 45 with existing streets. From IH 610 North to Beltway 8 North, ROW acquisition along IH 45 would likely be necessary at and between intersections. If the Hardy Toll Road were selected to accommodate the additional lanes, ROW acquisition would likely be required from IH 610 North to Beltway 8 North. The four-lane extension of the Hardy Toll Road from IH 610 North southward to the IH 10/US 59 interchange along railroad ROW is a separate project currently in the schematic design phase and would require ROW acquisition.

Existing major design deficiencies of IH 45 in the project area include:

- Lane and shoulder widths were reduced in certain portions of the facility to accommodate the reversible HOV lane, resulting in shoulder widths being less than the minimum design criteria of 10 feet. There are no inside shoulders between IH 10 and Shepherd Drive. Some lane widths have also been reduced from the minimum and usual criteria of 12 feet. Portions of the reversible HOV lanes and HOV shoulders along IH 45 are also substandard.
- Multiple bridges have low vertical clearances (i.e., distance between top of pavement and bottom of structure). TxDOT design guidelines recommend a desired vertical clearance of 16 feet 6 inches. Bridges at Cottage Street, North Main Street, North Street, Quitman Street, Hogan Street and West Dallas Street all have clearances of 14 feet 10 inches or less. These bridges are substandard based on the current design guidelines. The bridge at Cottage Street was struck by southbound trucks three times during a one-year period during 2007-2008 (TxDOT 2008).
- Various structures in the corridor, while not structurally deficient, are functionally obsolete, meaning that the width, vertical clearance, waterway adequacy, or approach roadway alignment are not adequate for the traffic type, traffic volume, or drainage needs.
- The vertical alignment of IH 45 from US 59 to Beltway 8 North contains multiple vertical curves that do not meet desired design speeds. Substandard vertical alignment affects safety because the driver's sight distance is less than optimum.
- The horizontal alignment of IH 45 from US 59 to Beltway 8 North contains multiple horizontal curves that do not meet desired design speeds.

Standard lane widths with adequate sight distances and clearances provide safety and comfort for drivers, and inside shoulders offer a place of refuge for disabled vehicles. A roadway that does not meet these design standards may be a safety hazard.

Pavement rehabilitation is also needed within the IH 45 corridor. Approximately 12.0 miles of pavement on the main lanes and frontage roads of IH 45 in the study area (4.5 miles of main lanes and 7.5 miles of frontage roads) were determined to be in poor or very poor condition in 2007.

1.2 Purpose of Proposed Action

The purpose of the proposed North Houston Highway Improvement Project is to implement an integrated system of transportation improvements that would:

- Manage the traffic congestion in the IH 45 corridor through added capacity, options for SOV lanes, and improved operations.
- Improve mobility on IH 45 between US 59 and Beltway 8 North by accommodating projected population growth and latent demand in the corridor.
- Provide expanded transit and carpool opportunities with two-way, all-day service on managed lanes, and access to METRO Park & Ride facilities.
- Bring the roadway facility up to current design standards with shoulders and auxiliary lanes to improve safety and operations.
- Expand capacity for emergency evacuations by providing proper design and flexible operation.
- Eliminate areas of flooding on the IH 45 main lanes.

The ultimate goal is to provide a facility with additional capacity for projected demand by incorporating transit opportunities, travel demand and management strategies, and flexible operations. Such a facility would help manage congestion, improve mobility, enhance safety, and provide travelers with options to get to their destinations.